L 00067-66

ACCESSION NR: AP5021326 UR/0170/65/000/004/0032/0035
537.534.2

AUTHOR: Ad'yasevich, B. P.; Alushin, V. D.; Smirnov, G. V.

TITLE: High frequency ion source in a strong magnetic field

SOURCE: Priboty i tekhnika eksperimenta, no. 4, 1965, 32-35

TOPIC TAGS: ion source, transverse magnetic field, strong magnetic field, ionization chamber

ABSTRACT: It has been shown earlier that HF discharge can be used as an ionizer of polarized atomic beams. However, such ionization may be accompanied by nuclear depolarization. It was then indicated that the depolarization probability may be significantly reduced if the atoms are ionized within a strong magnetic field decoupling the electron spins from those of the nuclei. The present authors investigated an appropriate UHF ionizer operating at 10,000 Mc within a strong magnetic field (4,200 Oe) normal to the electric field. The article presents the relationships describing the dependence of the ion current on the discharge chamber pressure and on the magnetic field strength. It supplies also the mass spectrum as a function of the discharge chamber pressure. In the case of very low pressure

Card 1/2

POVKH, I.L. Prinimal uchastiye SMIRNOV, G.V., inzh.; ZYSINA-MOLOZHEN, L.M., prof., doktor tekhn. nauk, retsenzent

[Aerodynamic experiment in the manufacture of machinery] Aerodinamicheskii eksperiment v mashinostroenii. 2. dop. i ispr. izd. Moskva, Mashinostroenie, 1965. 479 p. (MIRA 18:12)

SMIRNOV, G.V.

Measuring nonstationary pressures on the blade of a screw propeller.
Trudy LPI no.198:203-212 '58. (MIRA 12:12)
(Propellers--Blades) (Aerodynamics)

SMIRNOV, G. V., Cand Tech Sci (diss) -- "Investigation of the distribution of pressures on the surface of rotating machine parts". Leningrad, 1959. 12 pp (Min Higher and Inter Spec Educ RSFSR, Leningrad Polytech Inst im M. I. Kalinin), 150 copies (KL, No 10, 1960, 132)

POVKH, Ivan Lukich; Prinimal uchastiye: SMIRNOV, G.V., inzh.. KIRILLOV, I.I., prof., doktor tekhn.nauk, retsenzent; BOGDANOVA, V.V., kand.fiz.-mat.nauk, red.; SIMONOVSKIY, N.Z., red.izd-va; DUDUSOVA, G.A., red.izd-va; SHCHETININA, L.V., tekhn.red.

[Aerodynamic experiments in mechanical engineering] Aerodinamicheskii eksperiment v mashinostroenii. Moskva, Gos.nauchno-tekhn. izd-vo mashinostr.lit-ry, 1959. 394 p. (MIRA 12:9)
(Aerodynamics) (Mechanical engineering)

L 23807-66 EWT(m)/EWP(t) IJP(c) JD

ACC NR: AP6007245 SOURCE CODE: UR/0363/66/002/002/0217/0222

34
33
B

AUTHOR: Arslambekov, V.A.; Smirnov, G.V.

ORG: Institute of Physical Chemistry, AN SSSR (Institut fizicheskoy khimii AN SSSR)

TITLE: Oxide films on silicon

SOURCE: AN SSSR. Izvestiya. Neorganicheskiye materialy, v. 2, no. 2, 1966, 217-222

TOPIC TAGS: oxide formation, polycrystalline film, silicon, single crystal

ABSTRACT: After chemical etching of silicon in aqueous solutions there is always an oxide or hydroxide film on its surface with a thickness of tens or even hundreds of Angstrom units. Depending on the conditions of its formation, the properties of such a film can change radically with respect to thickness, structure, porosity, and degree of hydration, as well as with respect to its electrophysical properties. The structure and the degree of defectiveness of the boundary between the oxide film and the silicon can also change with a change in the conditions of formation and growth of the "natural" oxide film. The present article contains no new experimental data. It surveys previously published work in the field and draws certain theoretical conclusions. Irradiation of a

UDC: 546.28'21:539.238

Card 1/2

SMIRNOV, G.Ya.

Engineer Magal's plaster sprayer. Gor.khoz.Mosk. 21 no.7:38 Jl '47.
(MLRA 6:11)
(Plastering)

SMIRNOV, G. YA

20663 Dashirskiy, A. A. i Smirnov, G. Ya Potochno-skorostnoye stroitel'stvo. Tipovykh zhilkh domov v Moskue. Mekhanizatsign trudoyemkikh i tyazhelykh rabot, 1949, No. 6 s. 5-9

SO: LETOPIS ZHURNAL STATEY - Vol. 28, Moskva, 1949

1. SMIRNOV, G. Ya.

2. USSR (600)

4. Cranes, Derricks, etc.

7. Serious shortcomings of a necessary book: "Use of tower cranes in building low and medium-high buildings." G. V. Ivyanskiy. Reviewed by G. Ya. Smirnov, Mekh. trud. rab., 6, No. 10, 1952.

9. Monthly List of Russian Accessions, Library of Congress, February, 1953. Unclassified.

PLOTNIKOV, N.P., glavnyy redaktor; SVETLICHNYY, V.I.; DOROKHOV, V.; MUROMSKIY, P.G.; SPYSHNOV, P.A.; SMIRNOV, G.Ya.; KUPRIYANOV, Ye.M.; RAZINKOV, P., redaktor; LIL'YE, A., tekhnicheskiy redaktor.

[New technology on Moscow construction projects] Novaia tekhnika na stroikakh Moskvy. [Moskva], Moskovskii rabochii, 1954. 433 p. [Microfilm] (MLRA 8:2)

1. Nachal'nik Tekhnicheskogo upravleniya Mossoveta (for Plotnikov). 2. Zamestitel' nachal'nika Glavmosstroya (for Svetlichnyy). 3. Glavnyy inzhener Spetsial'nogo konstruktorskogo byuro Arkhitekturno-planirovochnogo upravleniya Mossoveta (for Dorokhov). 4. Nachal'nik Tekhnicheskogo upravleniya Ministerstva promyshlennosti stroitel'nykh materialov RSFSR. (for Muromskiy) 5. Nachal'nik Otdela po sanitarno-tekhnicheskim sooruzheniyam Gosudarstvennogo Komiteta Soveta Ministrov SSSR po delam stroitel'stva (for Spyshnov). 6. Glavnyy inzhener tresta "Moszhilmekhanizatsiya." (for Smirnov). 7. Direktor po nauchnoy chasti Vsesoyuznogo nauchno-issledovatel'skogo instituta organizatsii i mekhanizatsii stroitel'stva. (for Kupriyanov)
(Moscow--Building) (Moscow--Architecture--Desings and plans)

SMIRNOV,G.

Experience in using the MAZ-205 dump trucks for transporting gravel within the quarry. Avt.transp.33 no.7:19-20 Jl'55. (MLRA 8:12)
(Dump trucks)

BOLOBAN, N.A., kandidat tekhnicheskikh nauk; SMIRNOV, G.Ya., inzhener.

"Tower cranes for construction work." I.P.Barsov and others. Reviewed by N.A.Boloban, G.IA.Smirnov. Mekh.trud.rab. 10 no.3:46-47 Mr '56. (MLRA 9:7)
(Cranes, derricks, etc.)(Barsov, I.P.)(Surenian, G.S.)(Al'perovich, A.I.)(Chernov, A.N.)

BELOV, S.V., inzhener; SMIRNOV, G.Ya., inzhener.

Using machinery for the mechanization of loading and unloading.
Mekh.stroi. 13 no.6:17-21 Je '56. (MIRA 9:9)
(Loading and unloading)

KOZLOVSKIY, A.A.; KOGAN, I.Ya.; SMIRNOV, G.Ya.; POLYAKOV, V.G.; KORZHETSKIY, V.P.; KHROMOV, P.P.

Equipment for a four-legged tower crane assuring efficient movement and operation within a small working range. Rats. i izobr. predl. v stroi. no.2:46-48 '57. (MIRA 11:1)
(Cranes, derricks, etc.)

SMIRNOV, G.Ya.; VAKHONIN, V.A., nauchnyy red.; PAKHOMOVA, M.A., red. izd-va; TEYKHMAN, T.M., tekhn.red.

[Mechanic and assembly foreman I.I.Khudiakov] Brigadir slesarei-montazhnikov I.I.Khudiakov. Moskva, Gos.izd-vo lit-ry po stroit. i arkhit., 1958. 35 p. (MIRA 12:10)
(Khudiakov, Ivan Ivanovich) (Cranes, derricks, etc.)

SMIRNOV, G., inzh.

Lowering automotive transportation costs in construction. Na stroi. Mosk. 1 no.2:7-8 F '58. (MIRA 11:9)
(Moscow--Transportation, Automotive--Costs)

SOKOLOV, K.M.; YEVSTAFEYEV, S.V.; ROSTOTSKIY, V.K.; GRECHIN, N.K.; STANKOVSKIY, A.P.; BAUMAN, V.A.; BERKMAN, I.L.; BORODACHEV, I.P.; BOYKO, A.G.; VALUTSKIY, I.I.; VATSSLAVSKAYA, L.Ya.; VOL'FSON, A.V.; DOMBROVSKIY, N.G.; YEGNUS, M.Ya.; YEFREMENKO, V.P.; ZIMIN, P.A.; IVANOV, V.A.; KOZLOVSKIY, A.A.; KOSTIN, M.I.; KRIMERMAN, M.N.; LINEVA, M.S.; MERENKOV, A.S.; MIROPOL'SKAYA, N.K.; PETROV, G.D.; REBROV, A.S.; ROGOVSKIY, L.V.; SMIRNOV, G.Ya.; SHAFRANSKIY, V.N.; SHIMANOVICH, S.V.; SHNEYDER, V.A.

Evgenii Richardovich Peters; obituary; Mekh. stroi. 15 no.1:3 of cover Ja '58. (MIRA 11:1)

(Peters, Evgenii Richardovich, 1892-1957)

SMIRNOV, G.

Reorganization of truck transportation in the building industry.
Avt. transp. 36 no.5:6 My '58. (MIRA 11:6)

1. Avtotransportnyy trest "Glavrostovstroya."
(Transportation, Automotive)

SMIRNOV, G., inzh.

Using exhaust gases for heating dump-truck bodies. Na stroi.Mosk. 2 no.2:19 F '59. (MIRA 12:3)
(Dump trucks--Cold weather operation)
(Building materials--Transportation)

SMIRNOV, G.

Dismountable dumping equipment. Stroitel' no.5:19 My '59.
(MIRA 12:8)

(Dump trucks)

SMIRNOV, G.

Centralized management of the haulage of industrial and building freight. Avt.transp. 38 no.8:8-9 Ag '60.
(MIRA 13:8)
(Rostov Province--Transportation, Automotive)

SMIRNOV, G.

Measures for lowering transportation costs based on the analysis of operations. Avt.transp. 39 no.6:37-39 Je '61. (MIRA 14:7)
(Transportation, Automotive--Cost of operation)

SMIRNOV, G.

Centralized cement transportation in Rostov-on-Don. Avt.transp. 40 no.4:17-18 Ap '62. (MIRA 15:4)
(Rostov-on-Don--Cement--Transportation)

SMIRNOV, G.Ye., aspirant

Results of the use of lyophilized bone homotransplants in a surgical clinic. Uch. zap. Stavr. gos. med. inst. 12:270-271 '63. (MIRA 17:9)

1. Kafedra gospital'noy khirurgii (zav. prof. P.M. Kovalevskiy) Stavropol'skogo gosudarstvennogo meditsinskogo instituta.

IGNATOV, I.A., veterinarnyy vrach; SMIRNOV, G.Ye., veterinarnyy vrach.

Treatment of alimentary toxicosis in farm animals. Veterinariia 33 no.3:64 Mr '56. (MLRA 9:5)

1. Krasnozerskaya rayonnaya veterinarnaya lechebnitsa, Novosibirskoy oblasti.
(VETERINARY MEDICINE) (FOOD POISONING)

86359
S/046/60/006/004/008/022
B019/B056

6.8000 (3201, 1099, 1162)

AUTHORS: Smirnov, G. Ye., Tonakanov, O. S.

TITLE: The Fluctuations of Hydroacoustic Pulsed Signals by Reflection From the Water Surface in the Case of Wave Motion

PERIODICAL: Akusticheskiy zhurnal, 1960, Vol. 6, No. 4, pp. 482 - 490

TEXT: The measurements described here were carried out in a basin (10·4·4 m) under isothermal conditions. At the same time, the signals reflected from the surface and the wave motion were recorded. The waves produced by means of a wave generator in the basin had a height of from 3 to 10 mm, a wave length of roughly 20 cm, and the frequency was 2.8 cps. 70 - 200 kc/sec impulses were produced (pulse frequency 25 cps, duration: 450 microseconds). Reception of the reflected signals was effected by means of an undirected ferroelectric receiver. From the experimental results shown in form of diagrams the authors conclude on the basis of an analysis of the correlation functions of the signal and from the state of the surface that a clearly marked correlation exists between signal and the state of the surface. The correlation interval decreases with an

Card 1/2

SMIRNOV, I.

Device for determining defects in mine detectors. Voen.-inzh. zhur. 101 no.4:21-22 Ap '57. (MLRA 10:6)
(Mines, Military)

SMIRNOV, I.

Let's have more refrigerating equipment. Sov. torg. 35 no.6:17-19 Je '62. (MIRA 15:7)
(Refrigeration and refrigerating machinery)

A Conference for Exchange of Experience in the Operation of the Tu-104 (Cont.) 84-11-28/36

operational units with facilities for testing its assemblies. Miloslavskiy dealt with the problem of increasing the utilization rate up to 200 hours per month, and cutting the time of maintenance operations. Dovigora and Lipskiy reported on the introduction of repair methods of the engines and assemblies. The representative of the main designer, Markov, talked about future perfection of the Tu-104 type aircraft.

AVAILABLE: Library of Congress

Card 2/2

SMIRNOV, I.; LESNIKOV, V.

Branches of farm mechanization schools. Prof.-tekhn.obr. 19 no.11:3-4 N '62. (MIRA 16:2)

1. Nachal'nik TSelinnogo krayevogo upravleniya professional'no-tekhnicheskogo obrazovaniya (for Smirnov).
(Farm mechanization—Study and teaching)

GUDKIN, A.F., kand. sel'skokhozyaystvennykh nauk; MURUSIDZE, D.N., kand. sel'skokhozyaystvennykh nauk; SMIRNOV, I.A.

Use of ultraviolet rays in incubating eggs. Ptitsevodstvo 9 no.2:19-20 F '59. (MIRA 12:3)

1.Direktor Kasharskoy inkubatorno-ptitsevodcheskoy stantsii, Rostovskoy oblasti.
(Poultry--Feeding and feeding stuffs)

DUKMAS, G.Ya.; SMIRNOV, I.A., inzh.

An improved universal equipment bay. Avtom., telem. i sviaz' 7 no.8:31-33 Ag '63. (MIRA 16:9)

1. Nachal'nik laboratorii signalizatsii i svyazi Donetskoy dorogi, vneshtatnyy korrespondent zhurnala "Avtomatika, telemekhanika i svyaz'" (for Dukmas). 2. Laboratoriya signalizatsii i svyazi Donetskoy dorogi (for Smirnov).
(Railroads—Electric equipment)

BULGAKOV, Aleksandr Aleksandrovich; GUSEYNOV, Kamyan Asadovich; SMIRNOV, Ivan Andreyevich; VARSHAVSKIY, A.S., red.; IGNAT'YEV, V.A., tekhn. red.

[With the Italian workers] U rabochikh Italii. Moskva, Izd-vo VTsSPS Profizdat, 1961. 135 p. (MIRA 15:2)
(Italy—Labor and laboring classes)

SMIRNOV, I. A.

Under false slogans. Sov.profsoiuzy 17 no.12:39-42 Je '61. (MIRA 14:6)

(Pozzuoli--Office equipment and supplies)
(Italy--Industrial relations)

SMIRNOV, I.A.

The Trade Union Publishing House in 1963. Sov.profsoiuzy 18 no.22:43 N '62. (MIRA 15:12)

1. Glavnyy redaktor izdatel'stva Profizdat.
(Bibliography—Trade unions)

VARSHAVSKIY, A.S.; SMIRNOV, I.A.; BATISHCHEV, V.A.; KANAYEV, G.Ye.; CHUYKO, F.M.; VETROV, V.D.; YURIN, B.A., red.; KOROBOVA, N.D., tekhn. red.

[Handclasp of millions] Rukopozhatie millionov. [By] A.S. Varshavskii i dr. Moskva, Profizdat, 1962. 270 p. (MIRA 16:4)

1. World Trade Union Congress. 5th, Moscow, 1961. (Trade unions--Congresses)

SMIRNOV, I.A.; MOROZOV, N.M.; TEMKIN, M.I.

Kinetics of ammonia synthesis when the catalyst is poisoned by water vapor. Dokl. AN SSSR 153 no.2:386-389 N '63. (MIRA 16:12)

1. Fiziko-khimicheskiy institut im. L.Ya.Karpova. Predstavleno akademikom N.M.Zhavoronkovym.

L 53758-65

ACCESSION NR: AP5011687

(where: ω is the reaction rate; k_+ and k_- are rate constants for straight and reverse reactions; p_{N_2}, p_{H_2}, p_{NH_3}, p_{H_2O} are partial pressures; C and α are empirical constants. The constant k was calculated from the expression $k=\left(\frac{4}{3}\right)^{3(1-\alpha)}k_-$ (assuming $\alpha = 0.5$). At each temperature values of k were constant indicating applicability of this kinetic expression to the case of ammonia synthesis over Al_2O_3 activated iron catalyst in the presence of steam. Orig. art. has: 1 table and 2 formulas.

ASSOCIATION: Fiziko-khimicheskiy institut im. L. Ya. Karpova (Physicochemical Institute)

SUBMITTED: 29May64 ENCL: 00 SUB CODE: GC

NO REF SOV: 001 OTHER: 000

Card 2/2

L 05075-67
ACC NR: AP6013320 (N) SOURCE CODE: UR/0413/66/000/008/0137/0137

14
13

AUTHOR: Smirnov, I. A.

ORG: none

TITLE: A lock for automatic coupling of ships. Class 65, No. 180973

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 8, 1966, 137

TOPIC TAGS: ship component, shock absorber, transportation equipment

ABSTRACT: This Author Certificate presents a lock for the automatic coupling of ships with two symmetrical rotating claws. These claws are locked at the time of coupling by a spring-loaded wedge mounted in the frame of the lock so that it can slide. This wedge is immobilized by a locking mechanism (see Fig. 1).

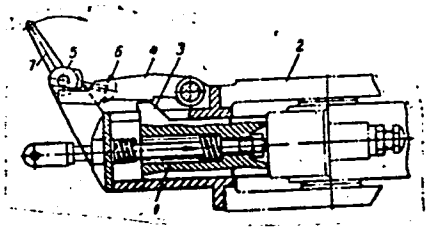

Fig. 1. 1 - wedge; 2 - lock frame 3 - collar; 4 - bracket arm; 5 - rotating checking device; 6 - counterweight; 7 - central arm

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ACC NR: AP6013320

The design permits the ships to be disengaged while they are under a lead. The wedge is made with a collar. The locking mechanism is made in the form of a bracket arm which is mounted on the frame of the lock so that it rotates. This bracket arm interacts with the collar and is held in place with the aid of a rotating checking device. The checking device carries a counterweight with a central arm and is connected to the frame of the lock. Orig. art. has: 1 figure.

SUB CODE: 13/ SUBM DATE: 14Feb63

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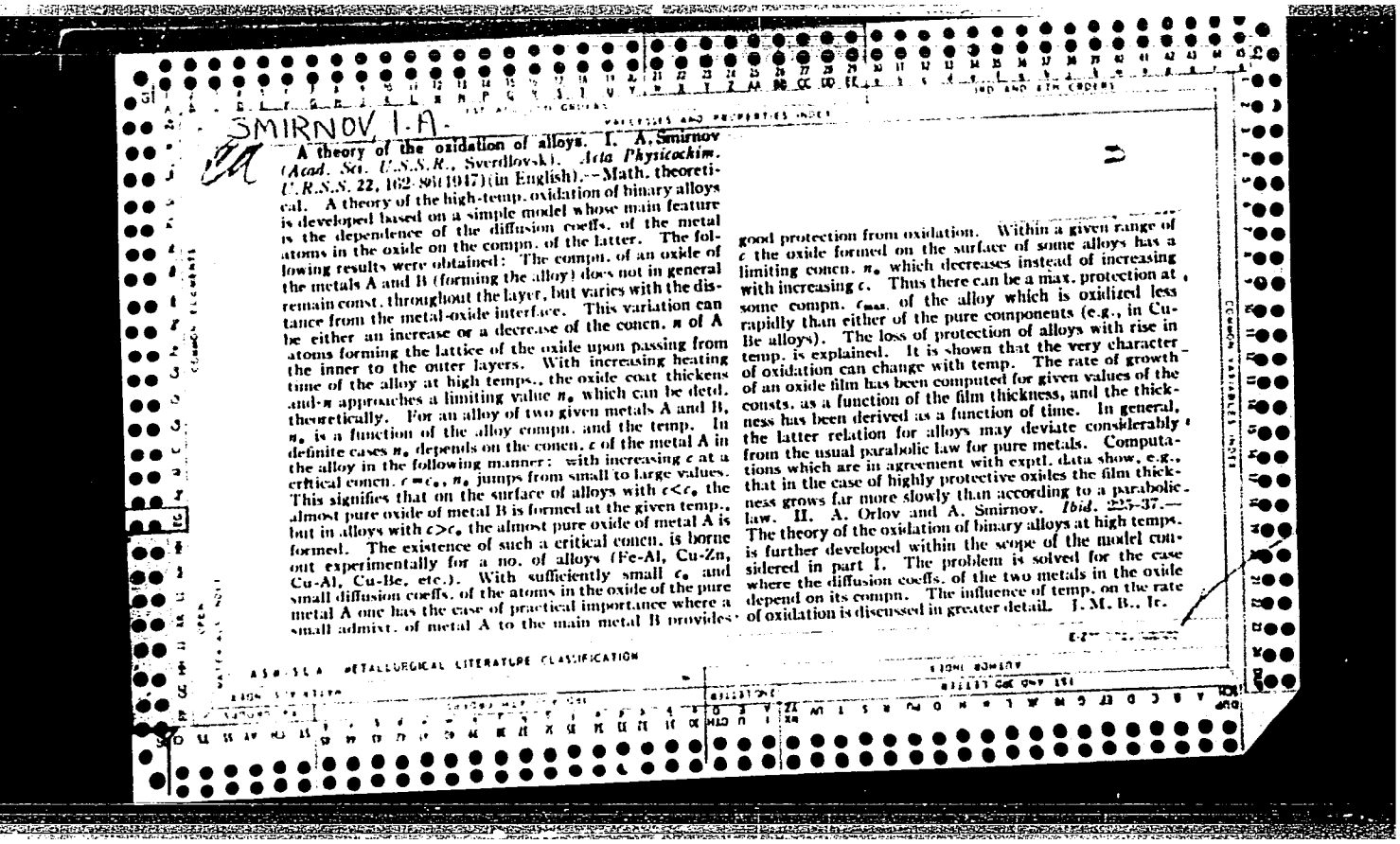

SMIRNOV I.A.

A theory of the oxidation of alloys. I. A. Smirnov (*Acad. Sci. U.S.S.R., Sverdlovsk*). *Acta Physicochim. U.R.S.S.* 22, 162-80(1947)(in English).—Math. theoretical. A theory of the high-temp. oxidation of binary alloys is developed based on a simple model whose main feature is the dependence of the diffusion coeffs. of the metal atoms in the oxide on the compn. of the latter. The following results were obtained: The compn. of an oxide of the metals A and B (forming the alloy) does not in general remain const. throughout the layer, but varies with the distance from the metal-oxide interface. This variation can be either an increase or a decrease of the concn. n of A atoms forming the lattice of the oxide upon passing from the inner to the outer layers. With increasing heating time of the alloy at high temps., the oxide coat thickens and n approaches a limiting value n_0 which can be detd. theoretically. For an alloy of two given metals A and B, n_0 is a function of the alloy compn. and the temp. In definite cases n_0 depends on the concn. c of the metal A in the alloy in the following manner: with increasing c at a critical concn. $c=c_0$, n_0 jumps from small to large values. This signifies that on the surface of alloys with $c<c_0$ the almost pure oxide of metal B is formed at the given temp., but in alloys with $c>c_0$ the almost pure oxide of metal A is formed. The existence of such a critical concn. is borne out experimentally for a no. of alloys (Fe-Al, Cu-Zn, Cu-Al, Cu-Be, etc.). With sufficiently small c_0 and small diffusion coeffs. of the atoms in the oxide of the pure metal A one has the case of practical importance where a small admixt. of metal A to the main metal B provides good protection from oxidation. Within a given range of c the oxide formed on the surface of some alloys has a limiting concn. n_0 which decreases instead of increasing with increasing c. Thus there can be a max. protection at some compn. $c_{max.}$ of the alloy which is oxidized less rapidly than either of the pure components (e.g., in Cu-Be alloys). The loss of protection of alloys with rise in temp. is explained. It is shown that the very character of oxidation can change with temp. The rate of growth of an oxide film has been computed for given values of the consts. as a function of the film thickness, and the thickness has been derived as a function of time. In general, the latter relation for alloys may deviate considerably from the usual parabolic law for pure metals. Computations which are in agreement with exptl. data show, e.g., that in the case of highly protective oxides the film thickness grows far more slowly than according to a parabolic law. II. A. Orlov and A. Smirnov. *Ibid.* 225-37.—The theory of the oxidation of binary alloys at high temps. is further developed within the scope of the model considered in part I. The problem is solved for the case where the diffusion coeffs. of the two metals in the oxide depend on its compn. The influence of temp. on the rate of oxidation is discussed in greater detail. J. M. B., Jr.

57-9-4/40

AUTHORS Devyatkova Ye.D., Smirnov I.A.

TITLE On the Heat Conductivity of Germanium.
(O teploprovodnosti germaniya.-Russian)

PERIODICAL Zhurnal Tekhn.Fiz.,1957,Vol 27,Nr 9,pp 1944-1949 (U.S.S.R.)

ABSTRACT The heat conductivity of 8 samples of p- and n-germanium was measured within the range of from 80 ÷ 300 k°. It is shwon that below 200°K the heat conductivity in samples of one and the same type depends on current darrier concentration,which can be brought into connection with the dispersion of the admixtures in atoms. The p-germanium samples were found to have greater heat conductivity in comparison to those of n-germanium within the entire investigated temperature range. On the occasion of the tranformation of a sample of the n-type into the t-type its heat conductivity increased accordingly.On the strength of experimental data it may be assumed that the microstructures of p-and n- germanium monocrystals differ. There are 4 figures and 2 tables.

ASSOCIATION Institute for Semiconductors AN USSR, Leningrad.
(Institut poluprovodnikov AN SSSR, Leningrad).

SUBMITTED March 21, 1957
AVAILABLE Library of Congress.
Card 1/1

DEVYATKOVA, Ye. D. and SMIRNOV, I. A.

Thermal conductivity of tellurium with various concentrations of impurities in the temperature interval 80 - 480°K. Fiz. tver. tela 1 no.4:613-627 '59. (MIRA 12:6)

1. Institut poluprovodnikov, Leningrad.
(Tellurium--Thermal properties)

ZHUZE, V. P., ZASLAVSKIY, A. I., PETRUSEVICH, V. A., SERGEYEVA, V. M., SMIRNOV, I. A. and SESLYKH, A. I.

Electrical and Thermal Properties on In Te - Semiconductor with Defect Structure.

report presented at the Intl. Conf on Semiconductor Physics, Prague, 29 Aug - 2 Sep 1960

Inst. of Semiconductors, Acad. Sci. USSR Leningrad

Thermal Conductivity of p- and n-Type Germanium With Varying Carrier Concentration in the Temperature Range 80-440°K

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ferent deviations starting from 320°K (Fig. 2). An attempt is made to calculate the additional thermal conductivity $\Delta\kappa$ on the assumption that it is due to heat transfer by electromagnetic radiation. Calculated values of the absorption coefficients have the same order of magnitude as the values established experimentally (Table 2). A comparison of values found for heat resistance with those given by other authors is shown in Fig. 3. From this it follows that $1/\kappa$ depends linearly on T for a not excessively pure germanium within a wide temperature range (from 80 to 1,000°K). The absorption coefficients of two samples were measured by G. B. Dubrovskiy; Chokhral'skiy is mentioned. There are 3 figures, 2 tables, and 22 references: 4 Soviet, 4 American, 9 British, 3 German, and 2 French.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad
(Institute of Semiconductors of the AS USSR, Leningrad)

SUBMITTED: May 16, 1959

Card 2/2

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S/181/60/002/008/044/045
B006/B063

24.7700

AUTHORS: Devyatkova, Ye. D., Smirnov, I. A.

TITLE: Thermal Conductivity and Change of the Lorentz Number in PbSe as a Function of the Degree of Degeneration of the Electron Gas and Temperature

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 8, pp. 1984-1991

TEXT: The authors of the present article wanted to study the thermal conductivity of PbSe at different impurity concentrations between 90° and 440°K and to determine A as a function of the degree of degeneration of the electron gas and temperature. The relation $\varkappa_{electr.} = L\sigma T$ holds for the electron component of thermal conductivity. L - Lorentz number, σ - electrical conductivity; $L = A(\frac{k}{e})^2$, where k denotes the Boltzmann constant. L depends on the degree of degeneration of the electron gas and on the mechanism of the scattering of electrons and holes. For

Card 1/4

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S/181/60/002/008/044/045
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Thermal Conductivity and Change of the Lorentz Number in PbSe as a Function of the Degree of Degeneration of the Electron Gas and Temperature

several elements and alloys, A has already been determined experimentally. In this connection, the authors discuss the results obtained by A. V. Ioffe, A. F. Ioffe, Devyatkova, and Yu. A. Dunayev. Eight p-type and six n-type PbSe samples were examined. Their carrier concentrations (Table) varied from $3.3 \cdot 10^{17}$ to $9.6 \cdot 10^{19}$ cm^{-3}. Four of the n-type samples were polycrystalline, and the rest were single crystals. The thermal conductivity and the thermo-emf of all samples, on the one hand, and the temperature dependence of electrical conductivity and the Hall constant, on the other, were measured simultaneously (by Ye. D. Nensberg). Fig. 1 shows thermal conductivity as a function of temperature; the curves of all samples show similar (exponential) courses, and the value for A is nearly equal to 2. Figs. 2 and 3 show the thermo-emf as temperature functions for p-type (Fig. 2) and n-type PbSe (Fig. 3). Some of the samples had a very low thermo-emf (20 - 160 μv/deg). Fig. 4 shows the curves of $A = f(\mu^*)$ theoretically calculated for different r-values, where μ^* is the reduced chemical potential ($\mu^* = \mu/kT$). r is the

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Thermal Conductivity and Change of the Lorentz Number in PbSe as a Function of the Degree of Degeneration of the Electron Gas and Temperature

exponent in the formula for the energy dependence of the mean free path of the electron: $l(T,\varepsilon) = l_0(T)\varepsilon^r$. Fig. 5 shows the coefficient of the thermo-emf α as a (theoretical) function of μ^*, and Fig. 6 shows A as a function of $|\alpha|$. All diagrams contain the curves for r=0, 1/2 and 1. The samples of an electron concentration of $4.5 \cdot 10^{17} cm^{-3}$ were found to be non-degenerate between 90° and 300°K, while those having an electron concentration of $9.6 \cdot 10^{19} cm^{-3}$ were completely degenerate between 90° and 360°K. In the first case $\varkappa_{electr.} = 3.554 \cdot 10^{-9}$ σTcal/cm.sec.deg, and in the second case $\varkappa_{electr.} = 5.84 \cdot 10^{-9}$ σTcal/cm.sec.deg. Fig. 7 shows the lattice-induced thermal conductivity as a function of temperature. The experimental values of all samples coincide within the limits of the accuracy measurement ($\varkappa_{total} = \varkappa_{lattice} + \varkappa_{electron}$). Fig. 8 shows A(T) for r=0, 1/2, 1 of a p-type sample of $6.2 \cdot 10^{18} cm^{-3}$. The experimental values calculated from the formula $A = \varkappa_{electr.}/\sigma T(k/e)^2 = (\varkappa_{total}$

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83025

Thermal Conductivity and Change of the Lorentz Number in PbSe as a Function of the Degree of Degeneration of the Electron Gas and Temperature

S/181/60/002/008/044/045
B006/B063

$- \varkappa_{lattice})/\sigma T(k/e)^2$ are also plotted. The results of the present article are finally summed up. Whereas the values obtained for $\varkappa_{lattice}$ of the samples coincide and no phonon scattering from impurities could be observed, the values for $\varkappa_{electron}$ follow the Wiedemann-Franz law if r = 0. In PbSe, the scattering from acoustic vibrations is predominant, and not the scattering from optical vibrations (r=1). There are 8 figures, 1 table, and 18 references: 11 Soviet, 5 British, 1 US, and 1 Japanese.

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors of the AS USSR, Leningrad)

SUBMITTED: February 4, 1960

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83025

S/181/60/002/008/044/045
B006/B063

24.7600

AUTHORS: Smirnov, I. A., Moyzhes, B. Ya., Nensberg, Ye. D.

TITLE: The Effective Mass of Carriers in Lead Selenide

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 8, pp. 1992-2005

TEXT: The authors studied the thermo-emf, α, and the carrier mobility of samples of p-type and n-type PbSe, and give a very detailed report on the results obtained. The carrier concentrations varied from $3.3 \cdot 10^{17}$ to $9.6 \cdot 10^{19}$ cm^{-3}. The electron gas is degenerated already here within various temperature ranges. The thermo-emf and the heat conductivity of all samples had already been measured (Ref. 13). A closer examination of the experimental material showed, however, anomalies in the behavior of α within the range of impurity conductivity (100 - 400°K). If the electron gas is not degenerate, the following relation holds for this range: $\alpha = \pm \frac{k}{e}\left[(2+r) + \ln \frac{2(2\pi m^* kT)^{3/2}}{h^3 n}\right]$ (k - Boltzmann

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The Effective Mass of Carriers in Lead Selenide

and 5). The temperature dependence of electrical conductivity, σ, and of the Hall constant, R, (Figs. 7 and 3) is also indicative of the temperature dependence of m^*. The mobility, u, was calculated from σ and R. log u = f(lg T) is shown for p-type (Figs. 8 and 9) and n-type samples (Fig. 10). u may be represented by $u \sim T^{-s}$ for almost the entire temperature range, where s = 2.64 for p-type samples and s = 2.4 for n-type samples. This deviation from the theoretical law - $u \sim T^{3/2}$ for non-degenerate and $u \sim T^{-1}$ for degenerate gas in scattering from acoustic vibrations - may be ascribed to the change of the effective mass with temperature. Considering the change in m^*, $\alpha(T)$ and u(T) are in good agreement with data on the electron component of heat conductivity (cf. Ref. 13). It follows from this that the mean free paths of electrons and holes do not depend on energy (r = 0), unlike what is the case with scattering from acoustic vibrations. In the last section of the present article, some suggestions are made concerning the energy bands in PbSe, PbS, and PbTe, which make it possible to relate the changes in the effective masses of electrons and holes with the changes in the forbidden band widths (Tables 3 - 6). N. V. Kolomoyets, T. S. Stavitskaya, L. S.

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S/181/60/002/011/029/042
B006/B060

24,7600 (1035,1043,1158)

AUTHORS: Zaslavskiy, A. I., Sergeyeva, V. M., and Smirnov, I. A.

TITLE: Heat Conductivity of Alpha and Beta Modifications of In_2Te_3

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 11, pp. 2885-2893

TEXT: This is a report on measurements made on the heat conductivity $\varkappa_{lat}$ of the crystal lattice of β-In_2Te_3, which, due to the strong scattering of phonons on statistically distributed vacancies in the indium sublattice, is abnormally small as compared with $\varkappa_{lat}$ of adjacent compounds in the isoelectronic series. X-ray structural analyses were made in parallel to $\varkappa$ measurements. The X-ray phase analysis was performed with a diffractometer of type УРС-50-И (URS-50-I), and a device described in Ref. 9 was used for $\varkappa$ measurements in the range 80-400°K. The preparation of α and β-modifications of the specimens is accurately described. Measurement results are illustrated in diagrams. Fig. 1 shows $\varkappa_{lat}(T)$ for cast and pressed specimens subject to different heat treatments (respective data

Heat Conductivity of Alpha and Beta Modifications of In_2Te_3

S/181/60/002/011/029/042
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high-temperature modification β-In_2Te_3 is very small and almost independent of temperature. This abnormally small value is explained by photon scattering on the statistically distributed vacancies in the indium sublattice. The heat conductivity of In_2Se_3 increases with the ordering of the lattice (α-In_2Se_3 has $\varkappa_{lat} = 2.68 \cdot 10^{-3}$ cal/cm.sec.deg at 300°K and rapidly increases with dropping temperatures). Results are in good agreement with X-ray structural analysis results. The formation of the α-modification with heat treatment depends on the crystal size, as it is the slower, the larger the crystals. The authors thank V. P. Zhuze for having posed the problem and for interest displayed, and Ye.D. Devyatkova for her remarks, B. Ya. Moyzhes for discussions. A. V. Ioffe, Ilisavskiy, and Petrov are mentioned. There are 3 figures, 3 tables, and 11 references: 9 Soviet, 1 US, and 1 Japanese.

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors of the AS USSR, Leningrad)

88443

S/181/60/002/011/030/042
B006/B060

24,7600 (1035, 1043, 1158)

AUTHORS: Petrusevich, V. A., Sergeyeva, V. M., and Smirnov, I. A.

TITLE: Relationship Between Thermal and Optical Properties of In_2Te_3

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 11, pp. 2894-2898

TEXT: The authors have offered a report on measurements of the heat conductivity of the crystal lattice of In_2Te_3 in Ref. 1 and have found that the $\varkappa_{lat}$ of coarse-crystalline specimens is considerably larger than that of fine-crystalline ones (in the range of 200-400°K). In the study under consideration here the authors have attempted to clarify the causes for this anomaly and in the present article report on results obtained in this respect. All specimens examined whose heat treatment is specified belonged to the α-modification. Fig. 1 shows $1/\varkappa$ as a temperature function; $1/\varkappa \sim T$. It is not possible to explain the additional heat conductivity by the assumption of electronic heat transfer or bipolar carrier diffusion, and the attempt is therefore made to explain $\Delta\varkappa$ by the assumption of a

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Relationship Between Thermal and Optical Properties of In_2Te_3

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B006/B060

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors of the AS USSR, Leningrad)

SUBMITTED: July 15, 1960

Legend to the Table: I - T, °K; II - λ, μ; III - experiment; IV - K, cm^{-1} (calculated from $\Delta\alpha$ for n=3,4); V - K, cm^{-1} (calculated from $\Delta\alpha$ for ε = 4); VI - K, cm^{-1} (experimental, without scattering being taken into account).

I	II	III	IV	V	VI
280	10.35	2.5	7.47	10.34	20.0
300	9.66	3.1	7.41	10.25	21.0
320	9.05	3.9	7.14	9.89	21.0
340	8.52	4.7	7.11	9.84	21.0
360	8.05	5.3	7.48	10.36	20.0

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Heat transfer on bipolar ...

at 300-800°K. The electric conductivity and thermo-emf were simultaneously measured in B; only the thermo-emf was measured in A. $\varkappa_1$ was calculated as difference from the measured total heat conductivity $\varkappa_e$. $\varkappa_e$ was calculated according to the Wiedemann-Franz law taking into account the degeneracy. Fig. 1 shows the function $1/\varkappa_1 = 1/(\varkappa - \varkappa_e)$ for PbTe at different hole concentrations. PbSe showed the same behavior. It is found that the deviation from the linear course is connected with the degree of purity. An additional heat conductivity by mixed conductivity and heat transfer by means of electron - hole pairs is assumed. The expression is:

$\Delta\varkappa = A\sigma(k/e)^2 T\left[\Delta E/2kT + 2\right]^2$ (1), where σ is the electric conductivity, ΔE the width of the forbidden zone at the temperature T, and e the electronic charge. $A = 4ab/(1 + ab)^2$, where $a = n_-/n_+$, $b = u_-/u_+$ are the ratios, the concentration, and the mobility, respectively, of the electrons and holes. Eq. (1) was checked by measuring the Hall coefficients and the electric conductivity. On the basis of the relations $n_- n_+ = n_{maj}^2 = n_-(n_+' + N)$ and $n_- = n_+'$; (n_-, n_+ are concentrations of free electrons and holes, N is the

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Heat transfer on bipolar ...

concentration of the minority carriers) it was calculated that $a = n_-/(n_- + N)$ for hole-type sample, and $a = n_+/(n_+ + N)$ for electron-type sample. n_{maj} for PbSe was calculated from $n_{maj} = 2(2\pi kT/h^3)^{3/2}(m_-^* m_+^*)^{3/4}\exp(-\Delta E/2kT)$, where m^* is the effective mass, $m^* \sim T^{0.4}$. Since the temperature dependence of m^* for PbTe is not accurately known, $R\sigma = (3\pi/8)u_+(1 - ab^2)/(1 + ab)$ is taken for the calculation of a, where $u_+ \sim T^{-2.5}$. It was assumed that b = 2.0 for PbTe and b = 1.1 for PbSe. For the calculation of n_{maj} and ΔXvalues of ΔE were assumed which were in the neighborhood of values obtained by optical measurements and comparable to the data of Gibbson (R. A. Smith, Physica, 20, 925, 1954) and W. W. Scanlon (see below). In good agreement with the experimental data, the calculation of (1) yielded: for PbTe $\Delta E = 0.32$ ev in the temperature range 436-700°K; for PbSe $\Delta E = 0.30$ ev at 500°K and $\Delta E = 0.34$ ev at 700°K. The additional heat conductivity of PbTe and PbSe is explained as being due to heat transfer as a consequence of bipolar diffusion of majority carriers. The participation of excitons assumed in the previous work is thus not confirmed. There are 2 figures, 2 tables, and

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Heat transfer on bipolar ...

7 references: 5 Soviet-bloc and 2 non-Soviet-bloc. The reference to English language publication reads as follows: W. W. Scanlon, J. Phys. Chem. Sol., 8, 423, 1959.

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors, AS USSR, Leningrad)

SUBMITTED: December 3, 1960

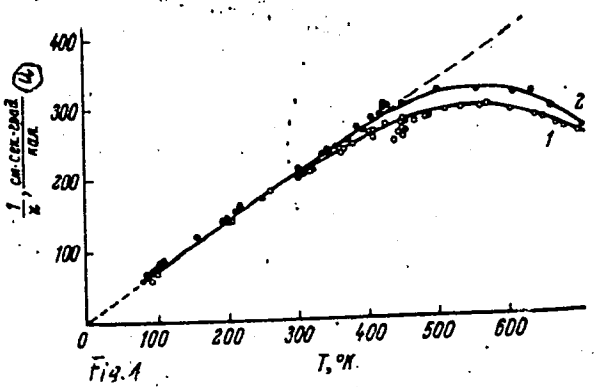

Fig. 1

Fig. 1. Heat resistance of the crystal lattice of PbTe as a function of the temperature.
Legend: 1) $n_+ = 5.2 \cdot 10^{17}$ cm^{-1}; 2) $n_+ = 1.2 \cdot 10^{19}$ cm^{-1};
a) cm·sec·deg/cal
(n_+ = concentration of impurity holes).

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24.7700 26.2532 24923 S/181/61/003/006/026/031
B102/B214

AUTHORS: Averkin, A. A., Moyzhes, B. Ya., and Smirnov, I. A.

TITLE: Change of electrical properties of PbSe under pressure

PERIODICAL: Fizika tverdogo tela, v. 3, no. 6, 1961, 1859 - 1862

TEXT: The authors investigated the effect of all-sided pressures of up to 9000 kg/cm^2 on thermo-emf α and electric conductivity σ of p- and n-type PbSe samples at room temperature. Oil was used for transmitting the pressure, which was measured by a magnetic manometer. Temperature was measured by copper-constantan thermoelements. The temperature difference between the two ends of the samples was $\sim$10°C. The mean temperature deviation in the whole range of pressures was not more than 0.2°C. An a. c. probe was used to measure σ. The degeneracy was taken into account in calculating α, σ, the carrier concentration n, the effective mass m^*, and the carrier mobility u under the assumption that the mean free path l does not depend on the carrier concentration. The values obtained are collected in the table. m^* was calculated from the change of thermo-emf, i. e. by using the formulas

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$$\alpha = \frac{k}{q}\left[\frac{r+2}{r+1}\frac{F_{r+1}(\mu^*)}{F_r(\mu^*)} - \mu^*\right]; \quad \frac{1}{a}\frac{da}{dP} = \frac{k}{aq}\left[\frac{r+2}{r+1}\frac{d}{d\mu^*}\left(\frac{F_{r+1}}{F_r}\right) - 1\right]\frac{d\mu^*}{dP}, \quad (1)$$

$$n = \frac{4\pi(2m^*kT)^{3/2}}{h^3}F_{1/2}(\mu^*); \quad \frac{d\ln m^*}{dP} = -\frac{1}{3}\frac{F_{-1/2}(\mu^*)}{F_{1/2}(\mu^*)}\frac{d\mu^*}{dP}, \quad (2)$$

when l depends on the energy in the form $l(\varepsilon) \sim \varepsilon^r$. Here F_r are the Fermi integrals and μ^* the level of the chemical potential in kT units. It was assumed that r = 0. To obtain separately change in mobility connected with a change in μ^*, the equivalent change in mobility for a nondegenerate sample was calculated from

$$\sigma = nqu_{mob.}\frac{\Gamma\left(\frac{3}{2}\right)}{\Gamma(r+1)}\frac{F_r(\mu^*)}{F_{1/2}(\mu^*)}; \quad \frac{d\ln\sigma}{dP} = \frac{d\ln u_{mob.}}{dP} + \frac{d}{d\mu^*}\left(\frac{F_r}{F_{1/2}}\right)\frac{d\mu^*}{dP}, \quad (3)$$

The following conclusions were drawn from the results of measurement:
1) From the fact that the p- and n-type samples showed very similar changes of the effective masses (1.64 and 1.86 % per ton) it can be assumed that the bottom of the conduction band and the upper edge of the valence band are situated at one point of k-space, and the components of

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the effective mass tensor are mainly determined by the matrix elements of momentum; in the principal axes $\frac{m_0}{m^*_{ae,h}} \approx 2\frac{|\langle\psi^*_b|p_\alpha|\psi_h\rangle|}{E_g m_0}$ holds. The subscripts e and h on the wave functions refer respectively, to electron and hole. E_g is the forbidden band width and m_0 the electron mass.

2) The magnitude of the relative change of the effective mass on compression compared to the change of the atomic distances is also explained with the help of this zone scheme. The compressibility of PbSe is $2.07 \cdot 10^{-6}$ cm^2/kg. At 1000 kg/mm^2 the atomic distance changes by 0.07 % while the effective mass changes by 1.8 %. 3) It is known from the theory of deformation potential that the effective mass changes on deformation to a greater extent than the constant of the deformation potential. This was confirmed here also as in Ref. 1(Smirnov et al. FTT, II. 8, 1992, 1960). 4) It was found in Ref. 1 that $m^* \sim T^{0.4}$. It is now sought to find out which part of the change of m^* is directly determined by the thermal expansion and which by the lattice vibrations. It is found that for both these effects together $\delta m^*/m^* \sim 4.8$ % per ton, while

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here $\delta m^*/m^* \sim 1.8$ % per ton pressure. This means that about 60 % of the change of m^* is related directly to the atomic vibrations, and about 40 % can be attributed to the thermal expansion. c) The quantity $\alpha^2\sigma$ characterizing the efficiency of a substance in thermoelectric apparatus increases significantly with pressure. The authors thank Ye. D. Devyatkova, G. Ye. Pikus, and A. R. Regel' for discussions, and Ye. D. Nensberg for preparing the single crystals. There are 1 figure, 1 table, and 7 references: 5 Soviet-bloc and 2 non-Soviet-bloc.

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors, AS USSR, Leningrad)

SUBMITTED: January 24, 1961

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Legend to the Table: 1) Number of the sample, 2) type of conductivity, 3) carrier concentration, 4) mean value for n-type samples, 5) mean value for p-type samples; $u_{Hеб}$ = mobility in non-degenerate sample.

$$S = \frac{d \ln u_{Hеб}}{d \ln m^*}.$$

№ образца (1)	Тип (2)	Концентрация носителей, $см^{-3}$ (3) n	$\frac{m^*}{m_0}$ при 300° K	α, мкв/град. при 300° K [$\mu v/deg$]	$\frac{1}{\tau_{ac}} + \frac{1}{\tau_{ion}}$, $сек^{-1}$	$u_{нев.}$	$\frac{d\alpha}{d\ln p}$, в % на 1 г	$\frac{d\rho}{d\ln p}$, в % на 1 г	$\frac{dm^*}{m^* d\ln p}$, в % на 1 г	S
71/2	n	$3.7 \cdot 10^{18}$	0.335	202	572	955	—1.1	5.5	—1.94	—2.96
265	n	$6.7 \cdot 10^{18}$	0.332	158	1100	1070	—1.07	4.6	—1.79	—2.81
(4) Средние значения для образцов n-типа.									—1.86	—2.88
23	p	$8.9 \cdot 10^{17}$	0.346	334	115	815	—0.67	6.0	—1.78	—3.40
70	p	$6.2 \cdot 10^{18}$	0.344	166	700	820	—1.1	4.6	—1.68	—2.93
909	p	$1.36 \cdot 10^{19}$	—	115	1750	—	—1.13	3.65	—1.46	—2.80
(5) Средние значения для образцов p-типа									—1.64	—3.04

27281

S/181/61/003/008/011/034
B102/B202

26.2532

AUTHORS: Devyatkova, Ye. D. and Smirnov, I. A.

TITLE: Effect of halogen impurities on the thermal conductivity of lead telluride

PERIODICAL: Fizika tverdogo tela, v. 3, no. 8, 1961, 2298 - 2309

TEXT: The thermal conductivity of PbTe has been studied already several times, however, the effect of various impurities has hitherto not been considered. Only T. L. Koval'chik and Yu. P. Maslakovets studied the effects of various impurities on the electrical properties of PbTe; they demonstrated that halogen impurities greatly increase the free-electron concentration. Samples that contain impurities in the form of $PbBr_2$ (or $PbCl_2$, PbI_2) also have a high absolute carrier mobility. Thermal conductivity, electric conductivity, Hall constant, and thermo-emf were measured in 14 pairs of single and polycrystalline PbTe samples with halogen impurities as well as in PbTe + 1% PbSe and PbTe + 1% SnTe solid solutions. The samples were produced from pure elements (lead 99.99% pure). All

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single crystals studied were of the p-type. They were obtained by crystallization with slow cooling. The pressed n-type samples $PbCl_2$ + Pb, $PbBr_2$ + Pb, and PbI_2 + Pb were obtained by the ordinary cermet method. The solid solutions were produced by melting together the initial substances in a stoichiometric ratio. Prior to the measurements the samples were annealed: the single crystals at 300°C, the polycrystals at 600°C (for several hours). After examination of their homogeneity, the measurements were made. The PbTe samples alloyed with PbI_2 were the most thoroughly studied. It was found that at halogen concentrations of the order of $3 \cdot 10^{19}$ - $2 \cdot 10^{20}$ cm^{-3} the thermal conductivity $\varkappa_p$ of the lattice considerably decreases which may be due to the large phonon scattering cross section of the halogens. Goldsmid tried to explain the anomalously large cross section by assuming that the halogen atoms are located in interstitial sites. Other studies made by Goldsmid (in Bi_2Te_3) and Koval'chik and Maslakovets indicate that they are located in the lattice sites and occupy the sites of tellurium. Hence, the reason of their large phonon scattering cross section remains unexplained. According to

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A. F. Ioffe, $\frac{\kappa_0}{\kappa} = 1 + \frac{N}{N_0} \Phi \frac{l_0}{a}$, where N is the impurity concentration, N_0 the number of atoms per cm^3, a the distance between two neighboring atoms in the lattice, l_0 the mean free path for phonons in the material containing no impurities, $\Phi = s/a^2$ (s - impurity scattering cross section) κ and κ_0 are the thermal conductivities in material with and without impurities. Φ was found to be between 3.00 and 3.74 for the samples studied, for the two solid solutions it was 0.73 and 0.64. Goldsmid measured $\Phi \simeq 13$ for chlorine and iodine in Bi_2Te_3. The results can be summarized as follows: Beginning at concentrations of $1 \cdot 10^{19}$ cm^{-3} the halogen impurities considerably reduce the thermal conductivity of the PbTe lattice. With $n \simeq 3 \cdot 10^{19} - 2 \cdot 10^{20}$ cm^{-3} the additional thermal resistance is proportional to the carrier concentration. The thermal conductivity of the lattice changes independently of the mass of the halogen added; the similar effect of the impurities can be explained by assuming a high static dielectric constant of PbTe. Phonon scattering from Se and Sn impurities is about 1/5 of the scattering from halogens. In the entire temperature range studied electric conductivity, thermo-emf,

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and thermal conductivity are independent of the type of the halogen and of the amount of excess lead. The authors thank B. Ya. Moyzhes for discussion and Yu. V. Ilisavskiy for communication of data. A. L. Efros, E. Burshteyn, P. Egli, A. A. Rudnitskiy, T. S. Stavitskaya, and Yu. P. Shishkin are mentioned. There are 10 figures, 5 tables, and 32 references: 18 Soviet-bloc and 14 non-Soviet-bloc. The two most important references to English-language publications read as follows: H. J. Goldsmid. Proc. Phys. Soc. London, 72, No. 463, 17, 1958; Y. Kanai, R. Nii. J. Phys. Chem. Sol. 8, 338, 1959.

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors AS USSR, Leningrad)

SUBMITTED: February 27, 1961

27282

S/181/61/003/008/012/034
B102/B202

9.4177 (1482) also 1144

AUTHORS: Devyatkova, Ye. D. and Smirnov, I. A.

TITLE: Carrier scattering mechanism in lead telluride

PERIODICAL: Fizika tverdogo tela, v. 3, no. 8, 1961, 2310 - 2318

TEXT: The exponent r in the relation $l(T,\varepsilon) = l_0(T)\varepsilon^r$ where l is the mean free path of electrons, ε the energy, characterizes the scattering mechanism. According to theory, r = 0 in the scattering of electrons from acoustic lattice vibrations which characterizes the covalent type of bond. In the scattering from optical vibrations r = 1/2 ($T < \Theta$) and r = 1 ($T > \Theta$) which is characteristic of the ionic bond. For scattering from impurity ions r = 2. Since the scattering mechanism of the carriers in PbTe has hitherto not systematically been studied, the authors studied it via determining r by measuring the electron contribution to the thermal conductivity and the carrier mobility as depending on temperature. They demonstrated that in PbTe scattering from acoustic lattice vibrations predominates (r = 0). This result had been obtained already by

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E. Z. Gershteyn, T. S. Stavitskaya, L. S. Stil'bans, and I. M. Tsidel'kovskiy. S. I. Pekar, E. Burshteyn, P. Egli et al, classified PbTe as belonging to the substances with ionic bond. The authors used the experimental data of a previous paper (present periodical, p. 2298) for PbTe with iodine impurity in order to determine r. The scattering mechanism, i. e., r was determined on the following basis:

scattering mechanism	u	$\alpha^2\sigma$	for $\varkappa_{latt} \sim T^{\frac{z}{2}-1}$	for $\varkappa_{latt}$ = const
thermal vibrations of ionic lattice	$T^{-1/2}$	T	T^2	T
thermal vibrations of atomic lattice	$T^{-3/2}$	const	T	const
scattering from impurity ions	$T^{3/2}$	T^3	T^4	T^3

Also the temperature dependence of mobility u, the thermo-emf α and the

electric conductivity σ were measured. The proportionality obtained indicated that in PbTe scattering from acoustic lattice vibrations ($r = 0$) predominates. Only in samples with carrier concentrations of $10^{19} - 10^{20}$ cm^{-3}, $r \neq 0$ ($r > 0$) at low temperatures. This is explained by a scattering of the electrons from impurity ions. In an appendix a detailed report is given on the calculation of thermal conductivity ($\varkappa_p \cong \varkappa_{lattice}$ and $\varkappa_{general}$) in halogenated n-type PbTe in the entire temperature range. There are 4 figures, 4 tables, and 16 references: 13 Soviet-bloc and 3 non-Soviet-bloc. The two most important references to English-language publications read as follows: W. W. Scanlon, Sol. State Phys., 9, 83, 1959; W. W. Scanlon, Phys. Chem. Solids, 8, 1959.

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors AS USSR, Leningrad)

SUBMITTED: February 27, 1961

SMIRNOV, I. A.

Dissertation Defended for the degree of Candidate of Physicomathematical Sciences at the Technical Physics Institute imeni A. F. Ioffe in 1962:

"Thermal Conductivity, Scattering Mechanism, and Effective Mass of Current Carriers of Several Semiconductors."

Vest. Akad. Nauk SSSR. No. 4, Moscow, 1963, pages 119-145

S/181/62/004/006/045/051
B108/B138

AUTHORS: Devyatkova, Ye. D., and Smirnov, I. A.

TITLE: The heat conductivity of p-type and n-type germanium

PERIODICAL: Fizika tverdogo tela, v. 4, no. 6, 1962, 1669-1671

TEXT: The heat conductivity of various p-type and n-type germanium single crystals was measured. Impurities (Ga and Sb) were introduced as the crystals were being grown. To obtain the most reliable results the thermo-emf was also measured. It was found that p-type and n-type Ge have the same heat conductivity. Earlier results showing a difference in the heat conductivities of p-type and n-type Ge were probably due to different ways of preparing the specimens. There are 2 figures and 1 table.

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors AS USSR, Leningrad)

SUBMITTED: February 12, 1962

Card 1/1

S/181/62/004/007/029/037
B178/B104

AUTHORS: Smirnov, I. A., and Shadrichev, Ye. V.

TITLE: Heat conduction of tellurium single crystals in the range 80-650°K

PERIODICAL: Fizika tverdogo tela, v. 4, no. 7, 1962, 1960-1963

TEXT: Two tellurium specimens obtained by slow cooling in vacuo were studied. The concentration of impurity holes was $\sim 2 \cdot 10^{16}$ cm^{-3}. During the investigation the heat flow passed along the crystallographic axis c. Before the experiments the specimens had been kept at 340° for 9 hrs. Fused quartz was used as a standard. The measurements (error, 5-8%) were made in an argon atmosphere. Besides the thermal conductivity, determinations were also made of the electrical conductivity and thermo-emf. An additional thermal conductivity was observed at ~ 150°K. Curve 2 shows the fraction of thermal conductivity produced by free carriers, which was calculated by $\varkappa_e = 2(k/e)^2 \sigma T$. Curve 3 shows the thermal conductivity in relation to the diffusion of electron-hole pairs. The forbidden band width, ΔE, of tellurium is $(0.32\text{-}3.5) \cdot 10^{-5}$ T. The additional thermal

Card 1/2

S/181/62/004/007/035/037
B111/B104

AUTHORS: Devyatkova, Ye. D., and Smirnov, I. A.

TITLE: NaCl and KCl single crystals as standards in thermal conductivity measurements from 80 to 460°K

PERIODICAL: Fizika tverdogo tela, v. 4, no. 7, 1962, 1972-1975

TEXT: As pure NaCl and KCl crystals have stable values of thermal conductivity they can be used for calibrating experimental arrangements or for comparison with measured thermal conductivity values of other crystals in the alkali-halogen group. NaCl and KCl crystals must be perfectly pure (thermal conductivity is changed by moisture and impurities) and must either be stored in dry places or be annealed before measurement. The crystals were grown from a melt of ХЧ (KhCh) salts, annealed through 6-8 hours at 600°C and then slowly cooled to room temperature. The measuring method is that employed by Ye. D. Devyatkova et al. (FTT, 2, 738, 1960). To reduce the heat flow by 60%, the specimens were arranged between gold and nickel plates. Results are summarized in the Table. The maximum

Card 1/3 2

40588

S/181/62/004/009/024/045
B104/B186

24.7600

AUTHORS: Devyatkova, Ye. D., and Smirnov, I. A.

TITLE: Temperature dependence of the heat-transfer resistance of some crystals close to the Debye temperature

PERIODICAL: Fizika tverdogo tela, v. 4, no. 9, 1962, 2507-2513

TEXT: With a view to establishing the factors that determine the variations occurring in the temperature dependence of the heat-transfer resistance of various crystals, the thermal conductivity of KBr, NaI, and CdT was exactly determined within the range 80 - 460°K, and the values so obtained were compared with published data (Devyatkova, Smirnov, FTT, 2, 1984, 1960; FTT, 3, 2296, 1961; FTT, 4, 7, 1962) relating to PbSe, PbTe, KCl, and NaCl. In order to prevent lateral loss of heat during the measurement, the lateral faces of the single crystals were coated with a dull black color. Above and below the Debye temperature, the heat-transfer resistance can be accurately described by the straight lines $1/\kappa_p = AT$ and $1/\kappa_p = BT$. The compounds can be grouped in three

Card 1/2

S/181/62/004/012/046/052
B125/B102

AUTHORS: Devyatkova, Ye. D., Kornfel'd, M. I., and Smirnov, I. A.

TITLE: Phonon scattering from impurity ions of Ag, Br, K, Li, I, and Rb in sodium chloride crystals

PERIODICAL: Fizika tverdogo tela, v. 4, no. 12, 1962, 3669-3670

TEXT: The heat conduction of NaCl-crystals was measured at room temperature with added Li^+, I^- and Rb^+. The local distortions of the NaCl-lattice near the impurity ions listed have been investigated by M. I. Kornfel'd, V. V. Lemanov (ZhETF, 43, 2021, 1962). The relative changes of the thermal resistance $\Delta R/R_o$ for the samples with impurities of Li^+, I^-, Rb^+ (present paper) and Ag^+, Br^-, and K^- as a function of the dimensionless $\eta = SN/R_o\bar{v}C_v$ fit the same curve very well. The values 0, 1.0, 2.0, 3.0, 4.0 and 5.0 of η correspond with the values ~0.32, ~0.48, ~0.62, ~0.74 and ~0.85 of $\Delta R/R_o$. S is the cross section of the distorted zone, N the number of impurity ions per unit volume, $\bar{v}$ the mean sound velocity, C_v the specific heat. There is 1 figure.

Card 1/2

34022
S/056/62/042/001/047/048
B142/B112

24,7500 (1144, 1482, 1454)

AUTHORS: Devyatkova, Ye. D., Kornfel'd, M. I., Smirnov, I. A.

TITLE: Phonon scattering from impurity ions in the NaCl crystal

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 1, 1962, 307-308

TEXT: The principal impurities contained in the NaCl crystal are Ag^+, Br^-, and K^+. Their presence causes the lattice distortions and the formation of scattering centers for phonons. The scattering cross section is proportional to the square of the radius of the distorted domains. This means that for Ag^+, Br^-, and K^+ the ratio of their scattering cross sections will be 1 : 2.0 : 3.5 (ratio of the radii of the distorted domains = 1 : 1.4 : 1.9). In the following proof is furnished for this statement. For low impurity ion concentrations $\Delta R/R_o = f(l_o/l_w)$, where R_o = thermal resistance of the pure crystal, ΔR = additional thermal resistance due to impurities, l_o, l_w = mean free path of phonons. Since $l_o \sim 1/R_o\bar{v}C_v$ and $l_w \sim 1/SN$, $\Delta R/R_o = f(\eta)$, where $\eta = SN/R_o\bar{v}C_v$. ($\bar{v}$ = mean sound velocity,

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SMIRNOV, I.A.; MOYZHES, B.Ya.

Change in the heat conductivity of cubic crystals due to deformation. Fiz. tver. tela 5 no.7:1958-1960 Jl '63. (MIRA 16:9)

1. Institut poluprovodnikov AN SSSR, Leningrad.
(Crystals--Thermal properties) (Deformations (Mechanics))

DEVYATKOVA, Ye. D.; IOFFE, A. V.; MOYZHES, B. Ya.; SMIRNOV, I. A.; KUTASOV, B. A.; GURYEVA, E. A.

"Change of thermal conductivity of the crystal lattice at uniaxial elastic stress or at the introduction of impurities and thermal imperfections."

report submitted for Intl Conf on Physics of Semiconductors, Paris, 19-24 Jul 64.

ACCESSION NR: AP4013500 S/0181/64/006/002/0430/0435

AUTHORS: Devyatkova, Ye. D.; Zhuze, V. P.; Golubkov, A. V.; Sergeyeva, V. M.; Smirnov, I. A.

TITLE: The thermal conductivity of Sm, P, and their simple chalcogen compounds

SOURCE: Fizika tverdogo tela, v. 6, no. 2, 1964, 430-435

TOPIC TAGS: thermal conductivity, samarium, praseodymium, chalcogen, crystal lattice conductivity, rare earth

ABSTRACT: This paper stems from a lack of thermal-conductivity information on rare-earth compounds and their compounds that have been recently studied in considerable detail for other properties. The compounds studied (PrS, PrSe, PrTe, and SmS) were synthesized from the constituent elements by the method described in Rare Earth Research (p. 135, 223, Ed. by E. V. Kleber, N. Y., 1961), and the thermal conductivity was measured on the "A" setup of Ye. D. Devyatkova, A. V. Petrov, I. A. Smirnov, and B. Ya. Moyzhes (FTT, 2, 738, 1960). Measurements on Sm, Pr, and the indicated compounds were made in the temperature interval 80-460K.

Card 1/2

ACCESSION NR: AP4039673 S/0181/64/006/006/1813/1817

AUTHORS: Devyatkova, Ye. D.; Golubkov, A. V.; Kudinov, Ye. K.; Smirnov, I. A.

TITLE: The effect of spin phonon interaction on the thermal conductivity of MnTe

SOURCE: Fizika tverdogo tela, v. 6, no. 6, 1964, 1813-1817

TOPIC TAGS: Neel temperature, spin phonon interaction, phonon phonon collision, thermal conductivity, magnon, manganese telluride

ABSTRACT: The authors have measured the thermal conductivity, the thermoelectromotive force, and the resistivity of a number of MnTe samples, both above and below the Néel temperature. The samples were prepared at a pressure of 8000 kg/cm^2 and then annealed in argon at 650C for 60 hours. The temperature dependence of the thermal resistance may be represented by two straight lines, one for temperatures below the Néel temperature (100-200K) and one for temperatures above (310-480K). Between these occurs a transition zone. At the lower temperatures, thermal resistance is determined by phonon interaction, and it increases normally with temperature. Transfer of heat by magnons may also contribute to heat conduction.

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ACCESSION NR: AP4043370 S/0181/64/006/008/2453/2456

AUTHORS: Guriyeva, Ye. A.; Kutasov, V. A.; Smirnov, I. A.

TITLE: Thermal conductivity of crystalline lattice of solid solutions based on bismuth telluride

SOURCE: Fizika tverdogo tela, v. 6, no. 8, 1964, 2453-2456

TOPIC TAGS: solid solution, bismuth telluride, crystal lattice, crystal growth, directional crystallization, thermal conductivity

ABSTRACT: It is pointed out that earlier experiments were made only at room temperature and failed to allow for the influence of many extraneous factors. To correct these shortcomings and to increase the number of investigated solid solutions, the authors measured the thermal conductivity of Bi_2Te_3 and of solid solutions on its basis in the temperature interval 80--120K. The solid solu-

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ACCESSION NR: AP4043370

of Semiconductors, AN SSSR)

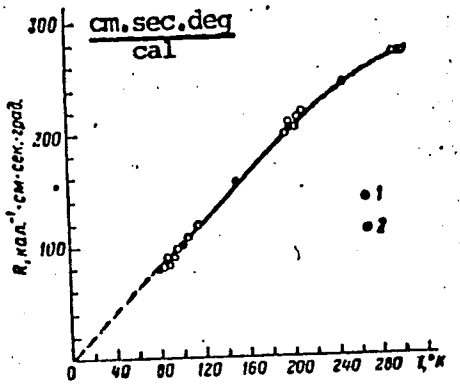
SUBMITTED: 06Mar64 ENCL: 02

SUB CODE: SS NR REF SOV: 004 OTHER: 012

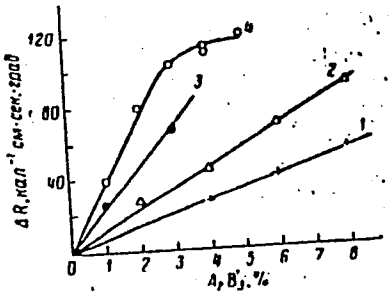
Card 3/5

ACCESSION NR: AP4043370

ENCLOSURE: 01



Dependence of thermal resistivity of Bi_2Te_3 crystal lattice on the temperature. 1 - data by others, 2 - present data



Dependence of change in thermal resistivity on the concentration of the second component at 100C. 1 - $(Bi-Sb)_2Te_3$, 2 - $Bi_a(Te-Se)_3$, 3 - $(Bi-In)_2Te_3$, 4 - $Bi_2(Te-S)_3$

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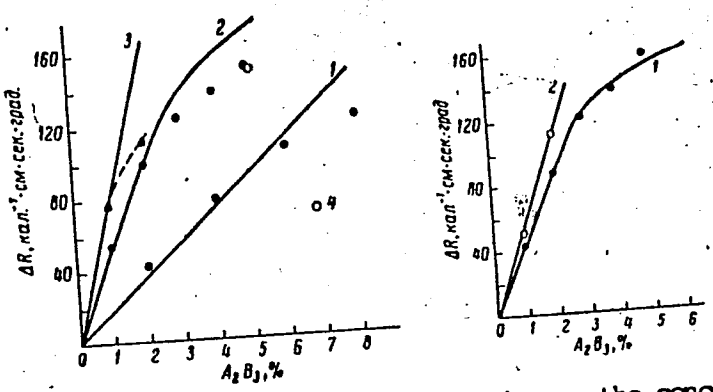
ENCLOSURE: 02

ACCESSION NR: AP4043370



Dependence of change in temperature resistivity on the concentration of the second component. Left: 1 - $(Bi-Sb)_2(Te-Se)_3$, 2 - $Bi_2(Te-S-Se)_3$, 3 - Bi_2Te_3 - In_2Te_3-Sb_2Te_3-Bi_2Se_3-Bi_2S_3, 4 - specimen obtained at slower crystallization rate. Right: 1 - $(bi-Sb)_2(Te-S)_3$, 2 - Bi_2Te_3-Bi_2Se_3-Bi_2S_3-Sb_2Te_3.

Card 5/5

SMIRNOV, I.A.; MOROZOV, N.M.; TEMKIN, M.I.

Kinetics of ammonia synthesis on an aluminium oxide-promoted iron catalyst poisoned by water vapors. Kin. i kat. 6 no.2:341-352 Mr-Ap '65. (MIRA 18:7)

1. Fiziko-khimicheskiy institut imeni Karpova, Moskva.

L 52527-65 EWT(l)/EWT(m)/T/EWP(t)/EWP(b)/EWA(c) IJP(c) JD UR/0181/65/007/004/1065/1077
ACCESSION NR: AP5010712

AUTHOR: Kutasov, V. A.; Moyzhes, B. Ya.; Smirnov, I. A.

TITLE: Thermal and electric properties, and the width of the forbidden band of the system of solid solutions Bi_2Te_2-Sb_2S_3

SOURCE: Fizika tverdogo tela, v. 7, no. 4, 1965, 1065-1077

TOPIC TAGS: bismuth compound, antimony compound, solid solution, electric conductivity, thermal emf, thermal conductivity, forbidden band

ABSTRACT: The authors measured the electric conductivity, the thermal emf, and the thermal conductivity of crystals of solid solution Bi_2Te_3-Sb_2S_3 in the direction of the cleavage planes. The apparatus used for the measurements was described in an earlier paper (FTT v. 2, 738, 1960). From the measurement results in the region of the start of the intrinsic conductivity, the authors calculated the width E_g of the forbidden band of Bi_2Te_3 and of the solid solution Bi_2Te_3-Sb_2S_3 (up to 9% of Sb_2S_3). The width was directly proportional to the added amount of Sb_2S_3, and increased 0.005 eV for each per cent of introduced Sb_2S_3. Its time derivative

Card 1/2

L 52527-65
ACCESSION NR: AP5010712

2

- dE_g/dT in the interval 300--420K is practically the same for the Bi_2Te_3 and the solid solution. The values of E_g calculated from different experimental data are in good agreement. The agreement between E_g obtained from optical measurements and the authors' calculations confirms that the mean free path of the carriers does not depend on the energy. "The authors thank Ye. G. Guriyev for help with the samples." Orig. art. has: 7 figures and 33 formulas.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors, AN SSSR)

SUBMITTED: 30Sep64 ENCL: 00 SUB CODE: SS, EM

NR REF SOV: 007 OTHER: 013

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Card 2/2

L 41591-66 EWT(m)/EWP(w)/T/EWP(t)/ETI • IJP(c) RDW/JD/JG

ACC NR: AP6018537 SOURCE CODE: UR/0181/66/008/006/1761/1771

AUTHOR: Golubkov, A. V; Devyatkova, Ye. D.; Zhuze, V. P.; Sergeyeva, V. M.; Smirnov, I. A.

ORG: Institute of Semiconductors, AN SSSR, Leningrad (Institut poluprovodnikov AN SSSR)

TITLE: Thermal conductivity of lanthanum and its monochalcogenites

SOURCE: Fizika tverdogo tela, v. 8, no. 6, 1966, 1761-1771

TOPIC TAGS: lanthanum, lanthanum compound, thermal conduction, rare earth metal, crystal lattice, thermal emf, temperature dependence, phonon scattering, electron scattering

ABSTRACT: This is a continuation of earlier research by the authors (FTT v. 6, 430, 1964) on the thermal conductivity of rare-earth metals and their compounds, and is devoted to a separation of the electronic and lattice components of the thermal conductivity of La, LaTe, LaSe, and LaS. The lanthanum monochalcogenites were synthesized from the constitutent elements by a method described in detail in the literature (Rare Earth Research, 223. Ed. by E. V. Kleber, NY, 1961; A. V. Golubkov et al., Neorg. mat. v. 2, 77, 1966) and were pressed into briquettes at high pressure followed by annealing. The measurement apparatus was described by the authors earlier (FTT v. 2, 738, 1960). The theoretical expressions for the two thermal-conductivity components are derived. From an analysis of the experimentally measured

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thermal conductivity, resistivity, and thermal emf and their temperature dependence it is deduced that an appreciable fraction of the total thermal conductivity is due to the crystal lattice. The temperature dependence of the lattice component can be attributed to the presence of two scattering mechanisms, phonons by phonons and phonons by conduction electrons. The low carrier mobility observed in the experiments is due essentially to strong electron-phonon interaction. The presently available data on LaTe, LaSe, and LaS are summarized in a table. The authors thank A. I. Zaslavskiy and T. B. Zhukova for the x-ray analysis, V. M. Muzhdaba and Ye. V. Goncharova for supplying data on the residual resistance and on the concentration, and Doctor Suchat for information on the degree of ionicity of the materials measured in this study. Orig. art. has: 7 figures, 7 formulas, and 5 tables.

SUB CODE: 20/ SUBM DATE: 03Nov65/ ORIG REF: 010/ OTH REF: 022

L 51546-65 EWT(1)/EPA(s)-2/EWT(m)/EPF(n)-2/EWG(v)/EWG(m)/EPR/EWP(t)/EWP(b)/EWA(1) Pe-5/Ps-4/Pt-7/Pu-4 IJP(c) RDW/JD/WW

ACCESSION NR: AP5010738 UR/0181/65/007/004/1221/1227

46 45 13

AUTHOR: Guriyeva, Ye. A.; Zaslavskiy, A. I.; Kutasov, V. A.; Smirnov, I. A.

TITLE: Thermal conductivity of solid solutions based on bismuth telluride

SOURCE: Fizikia tverdogo tela, v. 7, no. 4, 1965, 1221-1227

TOPIC TAGS: bismuth compound, thermal conductivity, solid solution, ordered solution, covalent radius

ABSTRACT: This is a continuation of an earlier investigation of solid solutions on the basis of Bi_2Te_3 in the region where there is no ordering. In the present study, the authors consider the behavior of the thermal resistance of complicated solid solutions in the ordering region. The test objects were solid solutions of bismuth sulfide and antimony sulfide, in which partial ordering is observed. The samples were prepared by directional crystallization from a melt of stoichiometric composition. The solid solutions up to 15% in steps of 1 mol.% were prepared. The apparatus was described elsewhere (FTT v. 2, 738, 1960). The measurements were carried out in the temperature interval 80--120K to eliminate the contribution made to the thermal conductivity by bipolar diffusion of electrons and holes. Both systems of

Card 1/2

L 9610-66 EWT(1)/EWT(m)/EPF(n)-2/EWP(t)/EWP(b)/EWA(1) IJP(c) ID/WW

ACC NR: AP5025378 SOURCE CODE: UR/0181/65/007/010/3003/3007

AUTHOR: Mirlin, D. N.; Oskotskiy, V. S.; Reshina, I. I.; Smirnov, I. A.; Tikhonov, V. V.; Zhurkov, I. S.

ORG: Institute of Semiconductors AN SSSR, Leningrad (Institut poluprovodnikov AN SSSR)

TITLE: Possibilities for quasi-localizable vibrations in infrared absorption and thermal conductivity in KCl-H crystals

SOURCE: Fizika tverdogo tela, v. 7, no. 10, 1965, 3003-3007

TOPIC TAGS: potassium chloride, absorption spectrum, IR absorption, thermal conduction, phonon interaction

ABSTRACT: The authors study the sidebands in the absorption spectrum on a localizable vibration as a function of temperature in potassium chloride crystals with a hydrogen ion impurity. A hypothesis is proposed that these bands are due to combined absorption on localizable and quasi-localizable vibrations. These quasi-localizable vibrations are assumed to be caused by attenuation of force constants when the hydrogen ion replaces the chlorine ion. The curve for thermal conductivity as a function of temperature in the 90-300°K range also shows the effect of quasi-localizable vibrations. The additional thermal resistance caused by hydrogen impurity ions is

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L 10567-66 EWT(1)/EWT(m)/T/EWP(t)/EWP(b) LJP(c) JD/AT
ACC NR: AP5025408 SOURCE CODE: UR/0181/65/007/010/3136/3138

AUTHOR: Saakyan, V. A.; Devyatkova, Ye. D.; Smirnov, I. A.

ORG: Institute of Semiconductors AN SSSR, Leningrad (Institut poluprovodnikov AN SSSR)

TITLE: Determining the high-temperature width of the forbidden band in PbTe

SOURCE: Fizika tverdogo tela, v. 7, no. 10, 1965, 3136-3138

TOPIC TAGS: semiconductor research, lead compound, telluride, polycrystal, forbidden zone width, semiconductor theory

ABSTRACT: The authors measure and calculate E_g for polycrystalline specimens of lead telluride in the 400-700°K temperature range. Ordinary powder metallurgy methods were used for producing n- and p-type specimens with current carrier concentrations of $\sim 5 \cdot 10^{18}$ and $\sim 1.7 \cdot 10^{18}$ cm^{-3} respectively. The formula used for calculating the width of the forbidden band is given. The calculated data are used for plotting $E_g(T)$. The curve is compared with the data obtained by other authors using various methods. Satisfactory agreement is observed. The change in E_g with temperature is

Card 1/2

MIRLIN, D.N.; OSKOTSKIY, V.S.; REShINA, I.I.; SMIRNOV, I.A.; TIKHONOV, V.I.; ZHURKOV, I.S.

Possible appearance of quasi-local vibrations in the infrared absorption and heat conductivity in KCl-H crystals. Fiz. tver. tela 7 no.10:3003-3007 O '65. (MIRA 18:11)

1. Institut poluprovodnikov AN SSSR, Leningrad.

ACC NR: AP6036320 SOURCE CODE: GE/0030/66/018/011/0479/0488

AUTHOR: Kutasov, V. A.; Smirnov, I. A.

ORG: Institute of Semiconductors, Academy of Sciences SSSR, Leningrad (Halbleiter-institut der Akademie der Wissenschaften der UdSSR)

TITLE: The effect of excessive antistructural Bi upon the thermal conductivity of the crystal lattice of Bi_2Te_3, Bi_2Te_3-Sb_2Te_3 and Bi_2Te_3-Bi_2S_3 with iodine admixture

SOURCE: Physica status solidi, v. 18, no. 11, 1966, 479-488

TOPIC TAGS: bismuth compound, tellurium compound, iodine, Hall constant, thermal electromotive force, semiconductor crystal, crystal growing, crystal lattice, crystal lattice structure

ABSTRACT: The heat and electrical conductivities, the thermal emf and the Hall constant of Bi_2Te_3 and of solid solutions of Bi_2Te_3-Sb_2Te_3 and Bi_2Te_3-Bi_2S_3 with the admixture of iodine were measured in the 77 to 120°K range using conventional measurement methods. It was found that deviations occur from the additivity law for heat resistance of solid solutions of Bi_2Te_3-Sb_2Te_3 and Bi_2Te_3-Bi_2S_3. The additivity effect is produced by the iodine admixture; the observed different deviations are caused by the antistructural admixture of Bi. It was assumed that antistructural Bi forms an "adhesive seat" and binds the admixed iodine atoms. In this manner, iodine

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is joined with Bi in "pairs" and thus for practical purposes is excluded from the phonon scattering. This hypothesis was verified by a direct measurement of the thermal conductivity of the Bi_2Te_3 lattice grown with a small excess Te or Bi with an admixture of 0.17% iodine (At). The authors thank Dr. G. I. Gelkov for conducting the chemical analysis of the Bi_2Te_3 specimens and of the solid solutions. Orig. art. has: 3 tables, 4 figures, 6 formulas.

SUB CODE: 20/ SUBM DATE: 12Apr66/ ORIG REF: 005/ OTH REF: 016

APPROVED FOR RELEASE: 08/25/2000 CIA-RDP86-00513R001651520010-0"

SOV/136-59-3-7/21

AUTHORS: Smirnov, I.B. and Loskutov, F.M.

TITLE: The Solubility of Lead in Soda Slags (Rastvorimost' svintsa v natriyevykh shteynakh)

PERIODICAL: Tsvetnyye Metally, 1959, Nr 3, pp 25 - 29 (USSR)

ABSTRACT: Previous work is summarised. The present work is an investigation of the solubility of lead in the Cu_2S-FeS-Na_2S system. A diagram of the apparatus used is given in Figure 1. It is designed to avoid the mechanical inclusion of lead in the sulphides and consists of an inner crucible containing lead surrounded by an outer crucible containing the sulphides with connections between the two above the level of the lead. The whole apparatus is heated in an electric furnace in an atmosphere of nitrogen. The Na_2S was prepared by a method due to Karyakin (Ref 7). The dehydration of the Na_2S is shown in Figure 2. It is heated in vacuo for 10-12 hours, the water being absorbed by P_2O_5 and then roasted in hydrogen at 700 °C. The result is 98-99% Na_2S.

Cardl/3

The Solubility of Lead in Soda Slags

Figure 3 shows a ternary diagram for the sulphides constructed from the results of 28 alloys. The influence of FeS is shown in Figure 4. As the FeS content increases the solubility of Pb increases. The smooth appearance of the curve suggests the absence of chemical compounds and eutectics. Lead in lead matte is present as oxide and sulphide; therefore, the activity of sulphur and the affinity of sulphur for lead influence the quantity of lead sulphide present. At the experimental temperature, the changes in free energy of formation of PbS and FeS are similar. Therefore, the reaction $Pb + FeS \rightleftharpoons PbS + Fe$ may go either way. This may explain the increase in Pb solubility with increase in FeS content. As the Na_2S content is increased the solubility of lead also increases. The changes in free energy of formation of PbS and Na_2S are quite different and the reaction $Pb + Na_2S \rightleftharpoons 2Na + PbS$ goes in the direction of formation of metallic Pb. However, metallic Na and Pb form stable compounds, removing Na from the sphere of reaction. This may explain the

The Solubility of Lead in Soda Slags

increase in Pb content in the sulphides with increase in Na_2S content. As the content of Cu_2S is increased, the solubility of lead decreases. Copper has a great affinity for sulphur which decreases the sulphidisation of lead. It was noted that lead has a slight solubility in Cu_2S.

There are 4 figures, 3 tables and 7 Soviet references.

ASSOCIATION: Krasnoyarskiy institut tsvetnykh metallov (Krasnoyarsk Non-ferrous Metals Institute)

SMIRNOVA, I.B.

Effect of sodium nitrite on radiation injury of the small intestine. Radiobiologiia 4 no.2:248-252 '64. (MIRA 18:3)

1. Institut morfologii zhivotnykh imeni A.N. Severtsova AN SSSR.

[illegible], [illegible], [illegible], SMIRNOV, I. D.

Tin Mines and Mining

Work experience of YA. N. Kharlashin's brigade. Gor. zhur. no. 3, 1952.

Monthly List of Russian Accessions, Library of Congress, April 1952. Unclassified.

24,4200

S/124/62/000/004/028/030
D251/D301

AUTHORS: Korolev, V. I., Smirnov, I. G. and Sokolov, V. N.

TITLE: Investigating the stability of a cylindrical shell with limited elasticity

PERIODICAL: Referativnyy zhurnal, Mekhanika, no. 4, 1962, 30, abstract 4V212 (Uch. zap. MGU, 1961, no. 193, 22-41)

TEXT: Results are given of the experimental investigation of the stability of thin cylindrical shells under the action of axial compression in the presence of a constant internal pressure. 500 mm dia. shells made of 1Kh18N9T (1Kh18N9T) steel and of AMG-6T (AMG-6T) aluminum alloy were tested. Thickness of the shell was in the range 1 - 2.5 mm. The shells were welded from sheets of the material. A satisfactory agreement between the theoretical and experimental values of the critical load of the shell was established. [Abstracter's note: Complete translation.]

Card 1/1

L 16517-66 EWT(d)/EWT(m)/EWP(w)/EWP(v)/EWP(k)/EWA(h)/ETC(m)-6 LJP(c) WW/EM
ACC NR: AP6002632 (N) SOURCE CODE: UR/0258/65/005/006/1134/1137

AUTHORS: Korolev, V. I. (Moscow); Smirnov, I. G. (Moscow)

ORG: none

TITLE: The stability of spherical shells beyond the limits of elasticity

SOURCE: Inzhenernyy zhurnal, v. 5, no. 6, 1965, 1134-1137

TOPIC TAGS: shell, shell stability, shell deformation, material strength/ AMG-6 alloy

ABSTRACT: The results of tests performed for the evaluation of the stability of spherical shells are presented. Tests were performed for the purpose of determining the critical value of uniform external pressure on a spherical shell under deformation beyond the elastic limit. The shell specimens were prepared from aluminum-magnesium alloy AMG-6; the specimens were first made as separate hemispherical sections which were later joined. Dimensions and certain characteristics of the specimens are tabulated. The tests were conducted in a specially designed chamber outfitted with a pump for supplying pressure and with appropriate instrumentation and controls. The loss of bearing capacity of a shell was detected visually with

Card 1/2

UDC: 624.074.2

ACC NR: AP7005846 SOURCE CODE: UR/0181/66/008/012/3578/3582

AUTHOR: Tikhonov, V. V.; Golubkov, A. V.; Smirnov, I. A.

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TITLE: Specific heat of NdS, LaSe, and LaTe

SOURCE: Fizika tverdogo tela, v. 8, no. 12, 1966, 3578-3582

TOPIC TAGS: neodymium compound, lanthanum compound, sulfide, selenide, specific heat, rare earth element

ABSTRACT: In view of the lack of data on the specific heats of these and other rare-earth compounds, the authors measured their specific heats in the temperature interval 900 - 390K, and determined their Debye temperature. The compounds were synthesized from the elements by a method described elsewhere (Neorganich. materialy v. 2, 77, 1966). The specific heat was measured in a Nernst adiabatic calorimeter. The total specific heat is found to satisfy the empirical formula $C_{tot} = \gamma T + AT^3$, and the values of γ are tabulated (AT^3 is the specific heat at constant volume). The Debye temperature was found to vary linearly with the atomic weight, and this is used to determine the Debye temperature and the melting temperature of all the monochalcogenides of rare-earth elements. A table listing the values of the specific heats at constant volume and constant temperature for the three investigated substances, and of the Debye temperatures and the melting points for all the monochalcogenides of the

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USSR/Electricity - **Transmission** Lightning Protection Apr 52

"Grounding the Ground Wires of Overhead Lines Through Spark Gaps," Docent A. I. Dolginov, Cand Tech Sci, I. G. Smirnov, Engr, V. D. Yurenkov, Cand Tech Sci, Moscow

PA 228T46

"Elektrichestvo" No 4 pp 3-10

Article states Soviets want to use capacitive coupling from the ground wires of overhead high-voltage lines to supply small consumers, for relay protection, communications, etc. However, according to

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article, they did not know whether these wires would afford the same lightning protection when grounded through spark gaps. Tests made at the Cen Lab of the High-Voltage Network of Mosenergo and the High-Voltage Lab of the Power Eng Inst, Acad Sci USSR, show that they do, article says: The use of overhead wires in this way has now been approved by the Tech Admin, Min of Elec Power Stations USSR. Submitted 26 Oct 52.

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SMIRNOV, I. G.

STEKOL'NIKOV, Il'ya Samuilovich; BORISOV, Vladimir Nikolayevich; SMIRNOV, Il'ya Grigor'yevich; OTOCHEVA, M.A., redaktor izdatel'stva; KONYASHINA, A.D., tekhnicheskiy redaktor.

[Lightning Protection of buildings and equipment in agricultural localities] Grozozashchita zdanii i sooruzhenii v sel'skoi mestnosti. Moskva, Izd-vo M-va kommun.khoz.RSFSR, 1956. 86 p.

(MLRA 10:4)

(Lightning protection)